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ABSTRACT

It has been argued that the answer to public and political demands for a more responsive educational system lies in the practice of accountability. The future implementation of program budgeting may offer an attractive vehicle for accountability. Currently, many California school districts use the California Educational Information System (CEIS) as a primary vehicle for information storage, processing, and retrieval. Although adequate for present needs, CEIS is ill-suited to effective support of accountability and program budgeting. The legislature should create an advisory commission on information systems to define the structure and services of a CEIS II, a statewide information system designed to support accountability and program budgeting. A CEIS II would require system definition to determine information needs, transitional mechanisms, legislative and economic frameworks, security and privacy issues, and a functional system design to translate needs into specifications for subsequent programing and testing. (Author)

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ACCOUNTABILITY, PROGRAM BUDGETING, AND THE CALIFORNIA EDUCATIONAL INFORMATION SYSTEM: A DISCUSSION AND A PROPOSAL

J. A. Farquhar

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PREFACE

This study was undertaken on behalf of the Governor's Commission on Educational Reform, State of California, using resources provided by a grant to The Rand Corporation from the Carnegie Corporation. Its initial scope involved study of the educational information-system requirements within California, with specific emphasis on the information needs associated with program budgeting and accountability.

As the study evolved, the information-system considerations under examination provided some interesting perspectives on the practical nature of accountability systems. As a result, this report is broader in scope than was originally intended, addressing aspects of the nature, purpose, and practice of accountability as well as the characteristics of an information system that would provide support in other areas of educational decisionmaking, such as financial accountability, curriculum planning, scheduling, and operations. It also provides both specific breakdowns of accountability information needs and flows within a school system, and a specific plan of action for a follow-on to the California Educational Information System (CEIS) to fully realize the potential value of the current CEIS.

The report should be of particular interest to educational planners and administrators concerned with the operational implications of possible accountability systems.

SUMMARY

A great deal of attention is currently being directed toward public education. It is felt in some quarters that the answer to public and political demands for a more responsive educational system might lie in the practice of "accountability"--holding educational planners and administrators responsible for educational outcomes. A variety of methods for realizing accountability have been proposed; three alternatives are performance contracting, decentralization and community control, and the voucher system.

The future implementation of program budgeting in California may offer an attractive vehicle for accountability. Program budgeting can be of considerable assistance to the educator and to the public in understanding the relationship of education inputs (human and material resources) to outputs (educated students).

The implementation of accountability through program budgeting requires comprehensive information support. Program planners will require exhaustive data on community objectives, program progress, and student-body characteristics. They will also require information on the short- and long-term resource implications of various educational strategies. Similarly, information must be provided to administrators, legislators, and the public to allow them to equitably judge the progress of the educational system and the impact of various alternatives.

Many California school districts now utilize the California Education Information System (CEIS) as a primary vehicle for information storage, processing, and retrieval. The current configuration of CEIS, although adequate for present needs, will be hard-pressed to effectively support accountability and program budgeting. In addition, it is unlikely that the current political and financial climate will allow CEIS to evolve toward such support.

For this reason, we recommend that the Legislature create an Advisory Commission on Information Systems to define the structure and services of CEIS II, a statewide information system designed in support of accountability and program budgeting. The Advisory Commission would be charged with defining the information needs associated with these

concepts and determining the costs, benefits, and economic and legal framework most attractive for effective usage and continued growth of CEIS II.

This report defines a suggested development plan for CEIS II design and implementation, structured as follows:

- *Phase I: System Definition (June 1971-May 1972)*--This phase would be used to determine information needs, transitional mechanisms (from the traditional environment to program budgeting and accountability), functional system design, legislative and economic framework, and security and privacy issues.
- *Phase II: Detailed System Design (March 1972-May 1973)*--During this phase, the information needs and design guidelines established in Phase I would be translated into detailed specifications for subsequent programming. This phase would also include hardware selection and detailed file design.
- *Phase III: Programming and Acceptance Test (June 1973-August 1974)*--Phase II results would be translated into computer programs. Hardware acquisition would also be carried out during this period.

Implementation of CEIS II should proceed deliberately from this point, gradually widening (following exhaustive "shakedown" periods) to serve the entire California system of public education. Sufficient funding and legislative impetus must also be provided to insure that CEIS II remains an evolving, dynamic tool to meet the diverse needs of public education.

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I. INTRODUCTION

The current turmoil in education stems from a variety of sources. Students clamor for more relevant education, parents for more effective teaching, and educators for more resources to meet these demands. Yet the electorate appears to have reached the point where no further monetary contribution will be made until overwhelming evidence of effectiveness and need is presented. The voters have perhaps begun to view the educational system as a bottomless pit into which money is poured with little definitive return. The dissatisfaction is evident in disapproved bond issues and tax elections. Public education thus faces the problem of trying to meet escalating expectations with existing resources.

Accountability offers a possible remedy for a number of present dissatisfactions. A concept popularized by Lessinger [1], accountability involves measurement of educational progress and achievement, coupled with identification of the human and material resources to which the achievement (or lack thereof) may be attributed. In theory, accountability may function at every level of the educational process: teachers may be held accountable for class performance, administrators for school performance, and so forth. Ultimately, the various segments of the educational community are accountable to the voters, who control a portion of the financial resources and who have the power to change state and local administrators.

Effective practice of accountability requires support in at least four areas:

1. Objectives of educational programs, to provide a basis for judging success;
2. Effective methods and criteria for measuring performance;
3. Identification of resources expended;
4. Information systems to aid in relating objectives and resources to educational outcome and to provide status information for use by teachers, administrators, and the public.

Program budgeting (also referred to as the Planning-Programming-Budgeting System) is a resource-allocation system. It involves

establishing objectives, identifying or establishing programs to accomplish these objectives, identifying resources, and measuring the effectiveness of selected programs. Therefore, program budgeting considerably aids decisionmakers to perceive relationships between resource expenditure and educational outcomes. It allows them to plan the educational process in a coherent and rational manner by providing a set of concepts and procedures for evaluating the present and future impact of educational programs.

This report addresses the fourth area, information systems. First, we examine in some detail the form of goals, programs, and evaluation mechanisms because these substantially determine the shape of the necessary information system. This report examines these items in the context of accountability and program budgeting to indicate the breadth and depth of the information required for educational planning and administration.

II. ACCOUNTABILITY AND PROGRAM BUDGETING

ELEMENTS OF ACCOUNTABILITY

The effective and equitable practice of accountability requires a coherent framework of concepts, methods, and techniques. Three of the most important items are

- o Goals and objectives,
- o An evaluational methodology,
- o An incentive structure.

In addition, accountability requires an understanding of who is responsible for specific outcomes and to what extent external factors mitigate that responsibility. Accountability also requires considerable information allowing decisionmakers to relate (1) goals and objectives to achievement, and (2) measures of achievement to resource expenditure.

Goals and Objectives

An essential element of accountability is a standard against which performance is measured. It is unrealistic to practice accountability without first involving educators in the formulation of precise and realistic objectives. In many cases, these are the behavioral objectives arrived at for individual classes. These generally relate to specific in-class achievements. Behavioral objectives may be too specific--or too diffuse--for realistic measurement and achievement.[†]

The introduction of program budgeting can be of considerable assistance in formulating goals and objectives. The program-budgeting process first establishes educational objectives and then establishes and assesses the resource implications of various alternatives. Properly established program objectives form the basis against which educational outcomes may be evaluated. This is done by breaking down program objectives (and programs) into component parts convenient for

[†]For comprehensive treatments of the subject, see Refs. 2 and 3.

specific evaluation. A full accountability system might best use both behavioral and program objectives--properly related--as benchmarks. Behavioral objectives are most appropriate for judging the performance of individuals; program objectives are attractive for evaluating overall school or district performance.

Evaluation

Evaluation involves measurement. Measurement of educational achievement can combine a wide variety of objective and subjective measures, all subject to diverse interpretations. Evaluation by teaching personnel is based in part on such quantitative measures as test scores. In large part, however, it is currently carried out subjectively: teaching personnel evaluate a student's performance by observing his interaction with all facets of the school environment.

It is important to point out the relative nature of accountability. Educators cannot be held responsible for educational achievement without full cognizance of factors beyond their influence. For example, it is unreasonable to expect that two teachers--one responsible for a class of economically advantaged students and one starting with a class of disadvantaged students--will have identical reading scores at the end of one year of "effective" teaching. Full account must be taken of a variety of factors that are external to the educational institution but that influence educational performance.

If accountability is to function in an equitable and effective way, more realistic (and perhaps complex) evaluation strategies, methodologies, and models of performance must be developed. Until this is done, results of evaluations must be carefully examined and weighed.[†] However, it is unrealistic to say that a judicious accountability system must await the developments sketched above. Instead, gradual progress toward full accountability can be an effective impetus to development of evaluation techniques by both spurring and shaping the necessary research.

[†]For a full treatment of the pitfalls inherent in interpretation, see Refs. 4 and 5.

Incentives

Incentives are an integral part of proposed accountability systems: if teachers and administrators have no financial or institutional incentives, it may be virtually impossible to use accountability as a means for improving educational outcomes.

It is in no way clear that incentives currently extant in public education are sufficient to support an accountability system. Nevertheless, for purposes of discussion we assume that they are. Present incentives include:

1. *Teaching profession:* (a) promise of advancement within teaching, (b) opportunities for assuming administrative responsibility, and (c) accompanying economic incentives.
2. *School administration:* (a) opportunities for advancement, and (b) existing economic incentives.
3. *District administration:* (a) existing economic incentives, and (b) school-board performance review.
4. *School boards:* (a) public scrutiny, and (b) electoral control.
5. *State administration:* (a) legislative scrutiny, and (b) electoral control.

ALTERNATIVE ACCOUNTABILITY SYSTEMS

This report is specifically oriented toward near-term accountability, that is, practiced within the current educational environment and organizational structures. Other organizational structures, evaluation methods, and incentives have been discussed as effective measures to introduce accountability. Five of these, enumerated by Barro [6], are

1. *Institutionalization of External Evaluation:* An impartial agency evaluates programs and reports results to administrators and to the public.
2. *Extension of Performance Incentives:* This has been put forth under the term "merit pay" and involves rewarding accomplishment through increased remuneration.

3. *Performance Contracting:* Contracting with an outside agency to perform educational functions and varying payment based upon the effectiveness of the services rendered.
4. *Decentralization and Community Control:* This involves making the school directly responsible to the community at an operational level, usually by establishing several local boards where one central board previously existed.
5. *Competitive Public Schools:* Provides parents with educational "vouchers"--documents that allow them to enroll their children in the school of their choice. If parents are dissatisfied with the quality of education at a particular school, they may simply transfer their children without regard to district boundaries.

Each of these five approaches is attractive to some observers. Each, of course, has its individual drawbacks. Some combinations might be used, e.g., both "External Evaluation" and "Performance Incentives." Implementation of any alternative would require considerable restructuring of the educational system. Implementation of an accountability system must not be made to wait upon such restructuring.

PROGRAM BUDGETING

Program budgeting is a resource-allocation system that provides the user with a set of convenient and powerful tools for judging where money and materials might best be expended. Program budgeting is more than an accounting system; it embodies a philosophy of rational resource allocation and evaluation.

Figure 1 illustrates the nature of program budgeting. Each of the four components of the process has associated activities that must be carried out by the decisionmaker. These components and activities are described below:

> The first component concerns the structural aspect. This involves the setting of objectives and the development of a program structure. These are interacting activities.

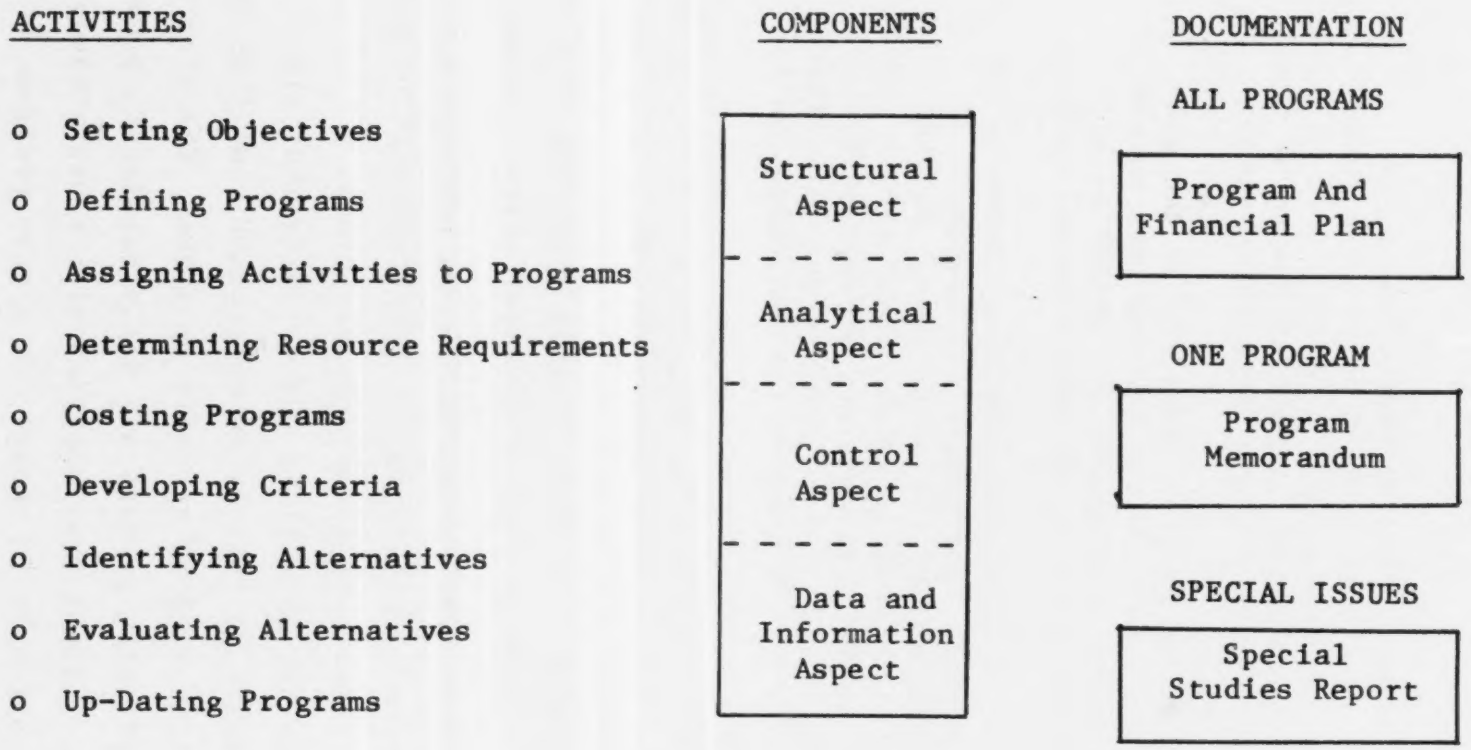

Fig. 1—The Nature of Program Budgeting[†]

[†]Source: Ref. 7, p. 5.

Attempts to identify groups of programs that, either singly or in combination, help to meet objectives will also help to clarify objectives. Conversely, clarification of the objectives will facilitate the task of grouping program elements into programs.

The second major component of program budgeting is the analytical aspect. It is within this area that the cost-effectiveness analyses and tradeoffs are made. It is in this area also that the generation or identification of alternative ways to meet objectives most often takes place.

The third major component of program budgeting is the control aspect. Basically, this involves keeping tabs on how well a new program is being implemented and recording program changes--in other words, progress reporting and control.

In the fourth component of a program budgeting system is its data and information aspect. The analytical component of program budgeting influences the choice of data. As the successful implementation and utilization of the system progresses, certain data appear that were not evident before. These data then become useful, not so much as an end in themselves, but rather because they support the analytical part of the process.†

THE RELATIONSHIP OF PROGRAM BUDGETING TO ACCOUNTABILITY

Accountability is a concept, an idea; program budgeting is a convenient structure for and implementation of accountability. It may be possible to effectively use program budgeting without practicing accountability. Likewise, accountability may be practiced without program budgeting. However, each greatly supports the other.

Program budgeting provides objectives and criteria that are tailor-made for accountability in that (when well-conceived) they represent rational expectations tied to specific programs. The efforts of administrators in the planning process are fully displayed, providing an excellent basis for judging that administrator's performance. Similarly, his day-to-day attempts to manage the chosen programs become much easier to evaluate. The same is true of teacher performance. Although accountability may be supported in other ways, program budgeting

†Ref. 8, pp. 6-7.

offers a most effective working framework for establishing and evaluating educational strategies.

III. INFORMATION NEEDS FOR ACCOUNTABILITY

Before we can establish information needs, we must examine the organization and structure of a school system and determine who is accountable for which outcomes. Therefore, we sketch a "typical" California school district that incorporates the characteristics of several districts and schools. Since public educational institutions have much in common, the example should be relevant to nearly every school district within the state.

SCHOOL DISTRICT ORGANIZATION

Figure 2 shows a typical school-district organization. It includes only those functions considered district responsibility and only those individuals located in the district offices.

District and school operations are examined as two distinct activities: instructional and financial. School systems often appear to be two separate and parallel entities. Program budgeting provides a means of relating and bringing together the two activities.

Figure 3 illustrates the organization of an individual school and the particular areas for which each administrator is responsible.

ACCOUNTABILITY IN THE INSTRUCTIONAL STREAM

Basically, educational personnel are held accountable for three general areas:

- Education planners are judged on (1) whether or not the chosen goals are desired by the school board, community, and state, and (2) whether or not the programs established effectively meet these objectives.
- Educational administrators are judged on their ability to monitor and administer the programs so as to bring about successful outcomes (if objectives and program design are sound).
- Teaching personnel and related administrators are judged on their ability to bring about the behavioral and educational outcomes stated in the objectives and implicit in the educational program structure.

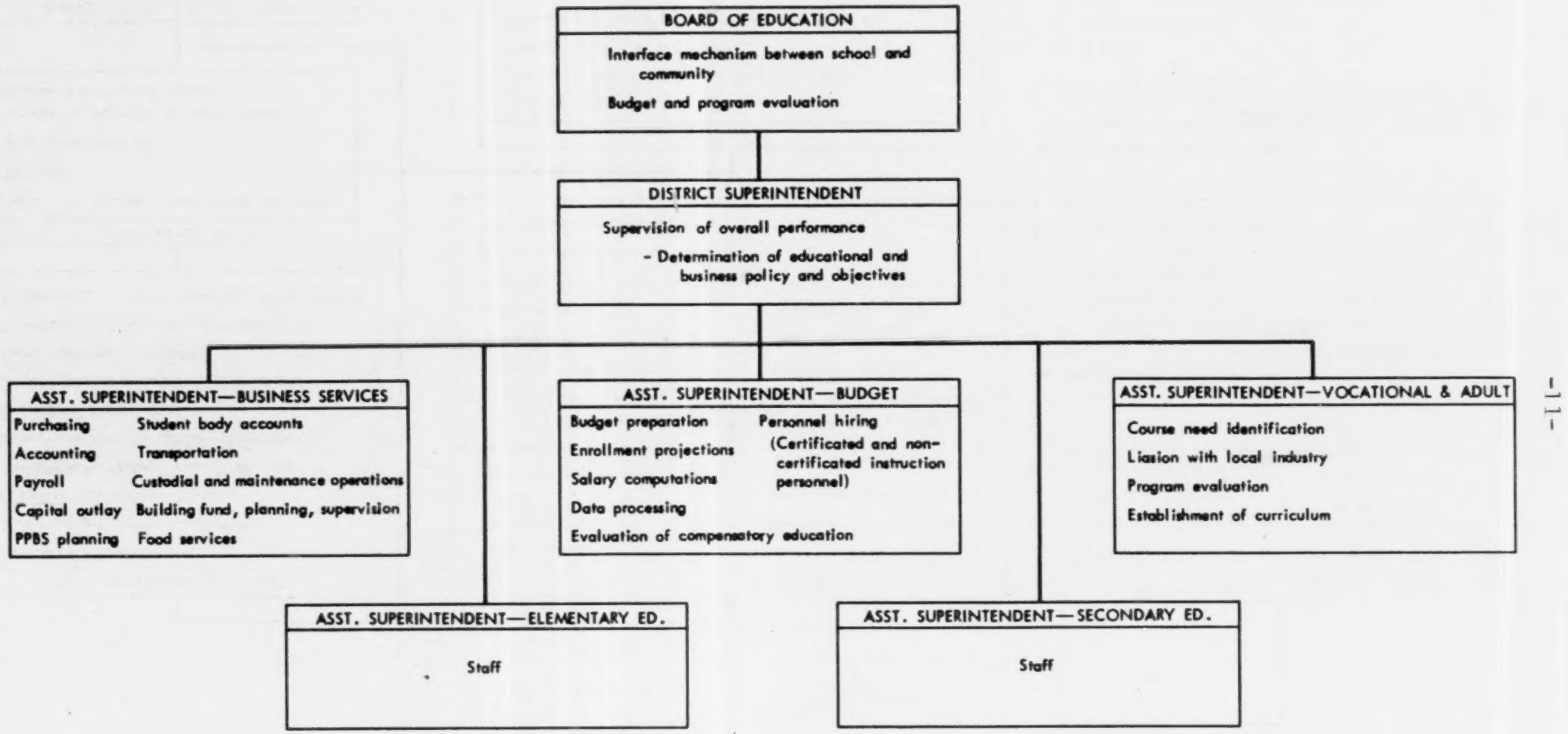

Fig. 2—District Organization

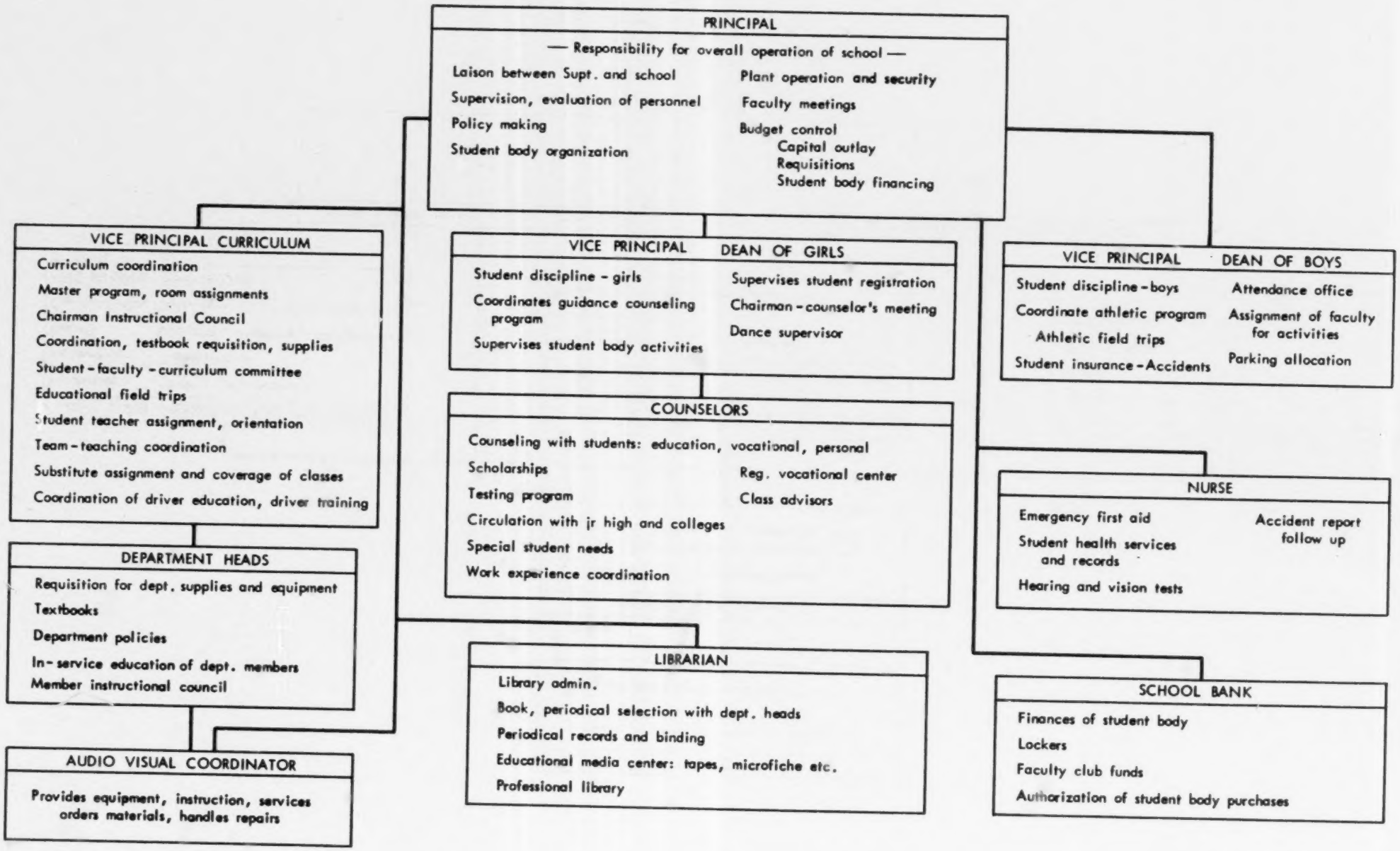

Fig. 3—School Organization

Goals and program structure must be associated both with the specific individuals who conceived them and with those responsible for administering and executing them. Personnel should not be held accountable for decisions not explicitly assigned to them. Similarly, a single individual should not be held accountable either for group decisions or for decisions arrived at according to established policy.

One must distinguish between *legal* accountability and accountability as a management technique. Legal accountability holds supervisors responsible for all action taken within their domain, whether initiated by themselves or by a subordinate. Legal accountability practiced in an educational context might well eliminate most initiative and creativity from the system, with everyone following "the book" or the safest course of action. Therefore, accountability as a management technique would only hold an educational manager directly accountable for his own decisions.†

INFORMATION FOR ACCOUNTABILITY

Each individual in the accountability chain needs two sets of information: (1) information for setting objectives and designing programs, and (2) information for ongoing administration and instruction. These two sets sometimes overlap considerably.

The educator setting goals and planning programs must have considerable information both on the strengths and deficiencies of the student body and on the capabilities of the instructional staff. This information allows him to set realistic objectives. In addition, he must possess a wealth of more subjective information on the needs, desires, and priorities of the community, the job market, and institutions of higher education. Finally, he must possess resource information as a means of determining the costs of various potential programs. Figure 4 summarizes the information necessary to the program planner.

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†Ideally, the organization should be structured to make legal accountability and management accountability coincide. Since for many reasons this cannot be done quickly, provision must be made for operating within current structures.

INFORMATION INPUTS	FUNCTION	INFORMATION OUTPUTS
Educational and social theory Demographic information Public desires Student performance information Labor market projections	1. Establish goals, objectives a. Program b. School c. Classroom	Goal statements
Goals and objectives Relevant experience Salary schedules (5-yr) Inventory cost schedules and status (5-yr) Facilities cost schedules and status (5-yr) Demographic information Public desires Previous performance Analytical and computational tools	2. Design alternative programs 3. Determine resource implications and benefits; choose programs	Elements of *Program and Financial Plan* Program memoranda Special studies reports Program inventory
Demographic information Previous performance	4. Establish performance criteria a. Program (district) b. School c. Classroom	Performance criteria Testing requirements (if any)
Program design (incorporating information used for functions 2 and 3)	5. Prepare budget	*Program and Financial Plan*
Program design	6. Identify points of accountability	Statements of responsibility
Information used for functions 2 and 3	7. Establish evaluation strategy	Evaluation plan
Demographic data Teacher skill and interest profiles	8. Allocate and assign: (Instructional Strategy) a. School administrators b. Classroom teachers c. Counseling services	Assignment notification

Fig. 4—Information Flow for Planning Activities

Administration of planned programs requires primarily student and teacher information, coupled with the data provided by ongoing evaluation. Figure 5 displays this information and its related educational function. Basically, the same information concerning a particular function is provided to each individual; reports differ in the degree of aggregation of the primary data elements.

PUBLIC INFORMATION

The final point of accountability is the voting public. This is not simply an accountability "option" to be included or excluded depending upon the will of district administrators. Public information must be provided if accountability is to work. A significant award for educational success is more money for salaries, equipment, and facilities. To approve such expenditures, the public must be fully informed of educational results.

The public will require not only information, but a vast amount of education concerning interpretation of data. Any school district that releases data without corresponding education is inviting disaster through misinterpretation. Although the educational portion of public information falls outside the bounds of this report, it should not be neglected by educators.

Information that rates one school against another should be provided *only* if parents are free to send their children to alternative schools. If this is the case, they have the right to know which is the "better" school.

In any case, the primary information provided should allow the public to judge their state and district in relation to all other districts and states. Because such data will be used for comparison purposes, they should be corrected for cultural and economic factors. Data provided to the public should also relate resource input to educational output. Any results disseminated to the public should be accompanied by publication of objectives and descriptions of the programs designed to meet these objectives.

ADMINISTRATION

INFORMATION INPUTS	FUNCTION	INFORMATION OUTPUTS
Grade reporting Test reporting, attendance reporting	1. Monitor educational outcomes	Investigation of exceptions; restatement of objectives
Recurring expenditure reports	2. Monitor expenditure	Investigation of exceptions; remaining funds budget
Combination of educational outcomes and estimate of available budget	3. Allocate discretionary items a. Task force personnel b. Specialists c. Aides	
All data gathered	4. Report progress to public	Board briefing; "fact sheet"
Attendance data	5. Report average daily attendance (ADA) to State	ADA summary
Facilities data	6. Allocate maintenance	Assignment notification

INSTRUCTION

INFORMATION INPUTS	FUNCTION	INFORMATION OUTPUTS
Resumé of successful methods Demographic Program goals and objectives State syllabus Experience	1. Establish instructional strategy	Instructional plan
Experience Demographic Norm-referenced measures Criterion-referenced measures	2. Evaluate educational progress	Report cards Parent-teacher conferences

COUNSELING

INFORMATION INPUTS	FUNCTION	INFORMATION OUTPUTS
Cumulative file Health data Teacher contact Behavioral referral form	1. Determine cause of behavioral referrals	Posting to student's cumulative files
Cumulative file Teacher contact College placement guide	2. Guide concerning aspirations and course necessities, vocational opportunities, college placement	n.a.

Fig. 5—Information Needs for Administration, Instruction, and Counseling

IV. PROGRAM BUDGETING, ACCOUNTABILITY, AND CALIFORNIA INFORMATION-SYSTEM POLICIES

The information discussed in the preceding sections may be provided in a variety of ways: manual information and accounting systems, computer systems operating at the school or district level, or purchased computer services. Within California, a service known as the California Educational Information System (CEIS) currently provides a working information system for many school districts. Due to its wide use, CEIS represents a logical focus for examination of how automated information systems might serve the needs described above. Alteration of CEIS would affect a large portion of California public education, both directly (for those it serves) and indirectly (through establishment of realistic and rational information system goals and service standards).

This section examines CEIS in the light of the information requirements described in Sec. III. Four questions are examined:

- How effectively does CEIS currently meet the needs of its user community?
- Given likely patterns of system growth, how effectively will CEIS support accountability, program budgeting, and educational management?
- What CEIS posture and configuration might best meet these needs?
- What steps might best insure that CEIS evolves into an effective, timely, and efficient support of accountability and program budgeting?

CURRENT CONFIGURATION

For purposes of discussion, CEIS may be divided into two large subsystems: pupil and business. The question of interfacing these two subsystems--vital to the implementation of a program-budgeting system--is discussed below.

Pupil Subsystem

The pupil subsystem currently provides five services to the school district:

1. Attendance accounting,
2. Test scoring,
3. Grade reporting,
4. Class scheduling,
5. Master-file maintenance.†

The five services are somewhat unrelated. For example, the printed "report cards" *do not carry* previous grades, nor are these grades recorded within the system. Thus, CEIS may have limited usefulness for perceiving trends or for any contemplated longitudinal study. This also severely limits the quality of the "guidance reporting" because trends cannot be displayed or evaluated.

Business Subsystem

Although the business subsystem is not currently available through CEIS, it is being tested and implementation should be feasible by 1972. This service is comprised of five separate parts:

1. Control system,
2. Accounts payable,
3. Stores inventory,
4. Financial (general ledger, etc.),
5. Personnel/payroll.

A detailed presentation of the State Bureau of Data Processing describes the proposed business subsystem [9]. In general, this subsystem provides the minimum level of finance and accounting capability necessary to insure continued operation of a school district.

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†An additional product of the master-file maintenance process is a guidance report.

CEIS Operations

Twelve regional centers operating throughout the state provide CEIS services to any school district willing to pay for them. Except for one center, which uses an IBM System/360, nearly all regional centers currently operate one or more Honeywell-H-200 computer systems. All CEIS regional-center communication is with the school districts. Except for an annual transmission of tapes to the state bureau, there is no communication of data between Sacramento and the regional center.

UTILIZATION OF CEIS

The CEIS pupil subsystem currently is used by about 33 percent of California's school districts, which are responsible for approximately 20 percent of the state's students. In general, it is not used by the very largest school districts (which have their own data-processing capability) or the very smallest (for which clerical services appear more economical). The average annual cost to the school districts is about $4.00/student for the full subsystem. Within Los Angeles County, 13 of the 97 school districts (and one private school) "subscribe" to the pupil subsystem.[†]

Regional centers are not restricted to providing only CEIS. The Los Angeles District CEIS Office, operating under the aegis of the County Board of Supervisors, provides other data-processing services to school districts. A series of finance and accounting programs (which perform the basic functions of the CEIS business subsystem) are now in operation. These are much more widely used by the districts than is the pupil subsystem: 92 out of the 97 districts use the payroll subsytem, 7 use the inventory subsystem, and 29 use the financial reporting subsystem.[††]

CEIS EFFECTIVENESS

Any judgment of CEIS service must be qualified by an explanation of its role:

[†]Personal communication with CEIS Regional Center, Los Angeles.

[††]Ibid.

- o CEIS is not mandated. No district has to use it against its will. Therefore, the base of CEIS support (both political and financial) is not as broad as it might be.
- o CEIS software is developed by the state, then turned over to the Regional Center. From this point on, state officials have no real control over CEIS use, public relations, or maintenance. Therefore, the CEIS package may vary widely in effectiveness and timeliness from one center to another, which accounts for widely disparate judgments of its value.
- o CEIS development and implementation funds have been extremely vulnerable. The level of support has fluctuated dramatically, causing uneven and discontinuous development. In addition, factors beyond control (such as the bankruptcy of the software contractor) have severely hampered effective development.

Remedies for some of these problems are discussed later in this section. Our primary concern here is the technical validity of CEIS and the worth of its basic concepts.

On the whole, the basic design of the current CEIS package is effective. The regional-center concept allows districts with "middle-sized" enrollments to use data-processing services. Most current users are districts too small to afford any dedicated computer system yet too large to economically perform accounting, personnel, and student-record processing manually. The present pupil subsystem offers the minimum services necessary to operate a school district. Many features, such as "irregular attendance reporting," guidance reporting, and other exception and analysis routines will, when implemented, significantly extend its capability.

The business subsystem is also effective by present standards. When implemented, it will produce over 50 recurring reports, including detailed analyses of personnel characteristics, qualifications, and turnover [9]. The business subsystem seems especially comprehensive in these areas, providing an effective system of reports both in standard payroll areas and in areas of interest to personnel administration. Final judgment must await implementation, when a determination of actual

effectiveness and district costs can be made. In general, however, CEIS seems adequate for the current needs of the average district.

CEIS AND FUTURE NEEDS

Should some form of accountability and program budgeting become reality, CEIS' value might diminish considerably. This judgment assumes that CEIS will remain essentially the same in concept, organization, and generated reports. The more serious problem areas are

1. *Cleavage between business and pupil subsystems:* An effective program-budgeting system requires that results be related to program expenditure. This is done by the decisionmaker, but an information system can provide substantial assistance. The first step involves relating expenditures, teachers, and students through some unique identifier, such as "program code." CEIS currently carries program code as an optional data item within the business-subsystem files. This usage must be extended throughout the pupil subsystem. In addition, procedures for updating and maintenance must be established.
2. *Lack of program orientation:* No provision exists for CEIS to report on expenditures or educational outcomes by program. Such reporting is necessary for program budgeting and very helpful in an accountability system. In addition, reports enabling "crosswalk"[†] between program and fund (or account) would have to be produced.
3. *Lack of planning analytical capability:* CEIS is weak in areas of trend analysis. Although data are held historically, there is no set of statistical analysis programs; this would help provide real insight into various program outcomes. Such analyses would also be valuable to the educational planner.

Other areas related to planning are similarly neglected. Such items as resource-modeling techniques, which allow assessment of the

[†]Crosswalk is a well-defined budget accounting by both program and account classification.

long-term implication of various allocations, are totally absent. Although such items are not generally considered part of an information system, they would greatly aid the educational planner concerned with program budgeting and accountability. Furthermore, since CEIS is intended as a resource for districts, such tools might reasonably accompany (and be integrated with) the information system.

None of the above is intended as a criticism of either CEIS or its designers. It represents a judgment of the shortcomings of CEIS in an environment totally different from that envisioned by the initial designers.

Nevertheless, given current levels of funding and interest, the ability of CEIS to get from "here to there" is in doubt. The production of a program orientation and analytical capability for CEIS will require both a considerable expenditure and a large preliminary design effort to further determine the needs of educators within the context of accountability and program budgeting. The magnitude and importance of this undertaking should not be underestimated. A well-designed, responsive information system can serve as an effective "catalyst" for both accountability and program budgeting. Conversely, a poorly designed system will, at best, only hamper efforts toward these goals; at worst, it might make such programs impossible to implement. A recent publication of the Advisory Commission on School District Budgeting and Accounting described a motion "to write a letter to the State Board of Education and the Department of Education...outlining the need for CEIS...".[†] Both the Advisory Commission and other sources must provide considerably more definition if CEIS is to fulfill its potential.

A SUGGESTED DEVELOPMENT PLAN FOR CEIS II

The discussion below outlines a specific blueprint (here called CEIS II) for developing CEIS into an effective and useful information system. Although directed toward support of accountability and program budgeting, this plan is equally valid if neither becomes a reality.

[†]Ref. 7, p. 2.

Before discussing the actual design of CEIS II, the larger problems of political (and hence financial) climate and commitment must be considered.

As stated above, CEIS development has continually been a victim of the politics of inattention. It has been relegated to a low-priority role, perhaps viewed as a luxury rather than a necessity. However, in the future an effective information system may be the keystone of educational planning and management. Our first recommendation implies a confirmation of this fact by the State of California and a consequent commitment to create a favorable political-financial atmosphere for CEIS development. This commitment might best be expressed by:

1. Creation of an Advisory Commission on Information Systems by the California Legislature. This Commission would operate in a manner similar to the Commission on School District Budgeting and Accounting.
2. Appointment to the Advisory Commission of ten members, drawn from education, government, and industry. Since primary definition of CEIS will come from state program-budgeting requirements, at least three of these members should also be members of the Commission on School District Budgeting and Accounting.
3. Endowment of the Advisory Commission with sufficient capital to contract for the need and requirements definitions outlined below. It is estimated the Commission will require a first-year appropriation of $800,000, to be followed thereafter by appropriations of $200,000/yr.

This Commission would elicit, through hearings and study sponsorships, the general information-system needs attendant to educational administration, accountability, and program budgeting and in turn state these requirements to the Bureau of Systems and Data Processing for implementation.

A Three-Phase Development Plan

The established Commission would be required and empowered to define the future direction of CEIS II and insure proper implementation.

The following is a suggested schedule for bringing CEIS II to operational status within approximately three years.

Phase I: System Definition (June 1971-May 1972). During Phase I, the Bureau of Systems and Data Processing would retain responsibility for maintenance and support of the current CEIS configuration. This phase would be devoted to examining the basic issues of CEIS II form, development, and implementation. Among the items examined might be:

- *Information needs of decisionmakers:* As sketched in Sec. III, information needs for effective accountability and program budgeting are complex, varied, and largely unknown. Further research is necessary through interviews, presentation of hypothetical examples, and examination of existing supportive information systems.
- *Transitional mechanisms:* A variety of methodologies are feasible for easing the decisionmaker's transition from the current to the projected environment. The best-known of these is the crosswalk. Other crosswalks must be developed in both financial and nonfinancial areas to insure that educators are not unreasonably required to decipher unfamiliar methods and reports. In addition, inservice training programs must be devised toward this same end.
- *Functional system design:* This area involves a gross determination of the form and function of CEIS II, describing (1) which data items must be reposited, (2) file structures, (3) file-maintenance procedures, (4) data-collection mechanisms, and (5) reports to be produced. This effort is the essential precursor of the detailed system design outlined in Phase II.

  Attention must also be given to the final implementation form of CEIS II. The degree of autonomy given to regional centers and the interconnection mechanism are two major issues to be decided.

- *Legislative framework for CEIS II:* Should the use of CEIS II, or some portions thereof, be mandated? Such a decision might run totally contrary to present philosophies of district autonomy; on the other hand, if CEIS II-supported accountability were shown to be a highly effective means of improving educational outcomes, pressures for a mandate might conceivably arise. A larger question concerns statewide standards for data reporting and record transfer. There are large benefits--and large costs--in having standard data-formats for all educational data-processing installations. A careful analysis should be made to determine an equitable standards policy.
- *Cost-sharing strategies:* There are a number of methods short of a mandate that might make CEIS II more attractive to the educational community. One method involves state subsidy of CEIS II operations, reducing per-pupil costs below those possible with a district-dedicated system. Other forms of subsidy, such as county or federal, might also be considered. A third alternative involves charging on a basis other than "per pupil," perhaps giving an advantage to the larger districts by charging some flat rate plus a reduced amount per pupil.
- *Security and privacy issues:* The physical security of many data-processing installations is being questioned because of recent incidents (e.g., at Fresno State College) and because of the concentration of invested capital and valuable data represented by a computer installation. The location and layout of the CEIS II regional centers should reflect this concern.

  Safeguarding the information against compromise is a related and central issue. Guidance toward and judgment of educational achievement requires a wealth of educational, demographic, and personnel data on both teachers and students. Unauthorized dissemination of this information could cause extreme embarrassment (particularly to students), especially within the complex social structure represented by a school.

Phase II: Detailed System Design (March 1972-May 1973). This phase involves translation of the needs, requirements, and gross system specifications into a design of the actual CEIS II hardware and software system. Specific tasks to be performed in this phase include:

- o Identification of appropriate hardware configurations.
- o Detailed file design.
- o Selection of "off-the-shelf" software that would perform required functions.
- o Design of computer programs to perform functions not available through purchased software (or where such purchase is uneconomical).
- o Validation of the chosen hardware-software complex through systems simulation.

Phase II might be carried out in one of two ways. The first involves assigning responsibility directly to the Bureau of Systems and Data Processing, with continued review and major decision-approval remaining with the Advisory Commission. The second involves having the Commission request proposals for system design, with the Bureau of Systems and Data Processing among those submitting proposals.

Phase III: Programming and Acceptance Test (June 1973-August 1974). This phase involves translating the detailed systems specifications into computer programs to accomplish the function specified. It also includes new hardware acquisition, if necessary.

A crucial step in this phase involves preparation by the Advisory Commission or its designee of an acceptance-testing procedure. This includes detailing specific operational tests that CEIS II must accomplish prior to full implementation. The testing is accomplished with dummy data prepared to insure as full a validation of software and hardware performance as is possible within the limits of time and money. Numerous instances have been noted where an ill-tested system has been offered to users, who immediately have difficulty with either timeliness or accuracy. Forced to go elsewhere for service, the users do not return, regardless of changes in the status of the original service. Furthermore, the "bad press" generated by this situation makes other potential users very reluctant to use the system.

Implementation (August 1974-)

Implementation might best be carried out on a gradual basis. Initially, some small number of districts--representative in size, sophistication, and experience--would participate in a final operational shakedown. *Only* after full satisfaction is achieved should the system be made fully available to California school districts. As stated above, CEIS II may have only one chance with potential users.

In reality, CEIS II implementation efforts will not stop in 1974. Other features may be added as desired and program maintenance will continue to be a major effort. Those charged with resource allocation should keep this in mind. All the effort described above may be wasted if support of CEIS II does not continue at a reasonable level.

Finally, research and development must continue. The concept embodied by CEIS II--a computer utility serving the educational community --is both sound and capable of providing exceptional benefits to all California students. Large areas amenable to automation, such as diagnostic-prescriptive aids, have not been mentioned here yet fit well within the CEIS II framework. Every effort should be made toward full development of these and other educational tools.

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